ANNUAL REPORT

OF THE

DIRECTOR OF AGRICULTURE AND FISHERIES

FOR THE YEAR

1961

PRINTED BY THE BERMUDA PRESS, LTD.

COMMONWEALTH MYCOLOGICAL INSTITUTE
21 AUG 1962

Board of Agriculture and Fisheries, 1961

C. Vail Zuill, Esq., J.P., M.C.P., Chairman

The Wor. F. L. R. Selley, M.C.P., Deputy Chairman

W. T. Wilson, Esq.

J. B. Ferguson, Esq.

E. R. Outerbridge, Esq., M.C.P.

H. Richardson, Esq., B.Sc., (Econ.)

Lady Conyers

T. James, Esq.

J. F. Bean, Esq.

R. M. Gorham, Esq., D.F.C.

M. N. Moniz, Esq.

DEPARTMENT OF AGRICULTURE AND FISHERIES

Gordon R. Groves, A.H.R.H.S., Director of Agriculture and Fisheries

I. W. Hughes, B.Sc., M.S.A., Assistant Director of Agriculture

E. A. Manuel, B.S.A., D.I.C., Plant Pathologist

C. W. Brown, B.Sc., M.R.C.V.S., G.V.O. to 11th August, 1961

J. H. Jones, Horticulturist

D. J. Moore, Superintendent, Botanical Gardens

C. V. S. Early, M.B.E., Agricultural Officer to 28th March, 1961

J. E. King, Reafforestation Superintendent

L. E. Tapsell, Reafforestation Superintendent

D. E. Marquardt, Reafforestation Superintendent

E. E. Sheppard, Marketing Officer

M. R. Shastri, Assistant Marketing Officer

Mrs. J. King, Clerk

Mrs. R. Barton, Accounts Clerk

Mrs. B. Hughes, Exhibition Secretary

FISHERIES DIVISION

L. S. Mowbray, M.B.E., Curator of the Aquarium and Museum
C. Christenson, Assistant Curator of the Aquarium and Museum
Vacant, Fisheries Officer

Other employees including foremen, mechanics, gardeners, reafforestation workers and Aquarium and Museum employees — 140.

Board of Agriculture and Fisheries, 1961

REPORT

OF

The Director of Agriculture and Fisheries, 1961

The Chairman, Board of Agriculture and Fisheries:

I have the honour to submit a report of the Department of Agriculture and Fisheries for the year 1961.

1. AGRICULTURE IN 1961

It is pleasing to report that the agricultural production was well maintained throughout the year under review. The milk production increased by 41,396 gallons in 1961; this, added to the increase of 58,000 gallons in 1960, gives a total increase of 99,396 gallons over the 1959 production figure. The farm value of the milk produced in 1961 was £215,868, vegetables £173,246, fruit £50,000, flowers *£7,930, eggs £175,000 and meat £12,212, making a grand total of £634,256. *This figure is the value of the flowers exported. Many flowers are grown for the domestic market; but it is not possible to accurately estimate their value.

Vegetable Production

Produce to the value of £58,000 was purchased by the Government Marketing Centre compared with £60,000 in 1960. The potato crop was not quite as heavy as the previous year. Again, restrictions were placed on the importation of fresh vegetables when local supplies were adequate to fulfil requirements. The restrictions were enforced under the Importation of Fruit, Vegetable and Flower Act, 1961.

Citrus Culture

Due to the difficulty experienced in scheduling five citrus sprays during the last two years, it was decided that four sprays only would be attempted in 1961. Through the use of the newer miticides, fungicides and insecticides the control of citrus pests and diseases was excellent, despite the reduction in the number of treatments. Control of rust mite was particularly good.

There are now 631 citrus growers taking advantage of the spray service, with 8,531 trees being treated. Allowing for the trees not yet large enough to be entered in the spray service, along with those belonging to growers who do their own spraying, there are now approximately 10,000 citrus trees in Bermuda, with an estimated yield of 100,000 dozen fruits in the year under report.

The Department propagated 1,439 citrus trees in 1961, of which 895 were large enough to be offered for sale.

The Easter Lily Trade

There was a further decline in the export of Easter lily flowers in 1961. The declared customs value of the flowers exported was £7,930 compared with £10,488 in 1960.

Dairying

Returns from the two pasteurizing plants reveal that the dairy farmers produced 761,886 gallons of milk throughout the year 1961 which is 41,396 gallons more than was produced in the previous year. This is regarded as a fine achievement, and should emphasise the importance of the dairy industry in Bermuda. During recent years the daity herds have definitely been improved, which is thought to be largely due to the protection which has been given under the Dairy Industry (Protection) Act, 1952. This Act is due to expire in 1963, but it is hoped that the progress made in the dairy industry during the last ten years will be taken into consideration when the Act comes up for review in 1963.

Poultry

The production of eggs has been built up to an important business undertaking. The main production of eggs is in the hands of eight people who have shown a steady increase in egg production over the last five years.

Animal Products

Meat inspected in the slaughterhouses amounted to 1,085 carcasses of pork and 344 carcasses of beef and veal. In addition 16 goats were slaughtered for meat. The greatest need in this connection is a **modern slaughterhouse,** centrally located, where all the slaughtering could take place. At the time of reporting two slaughterhouses are in operation, one in St. George's and the other in Southampton.

Spraying Services

The new 300 gallon spray truck was used to good advantage during the year. For citrus work it is usually more convenient to have two 300 gallon sprayers in operation with the 500 gallon unit as a spare. When farm work is being done one 300 gallon unit and the 500 gallon sprayer are usually used.

In 1961, the Department applied 198,400 gallons of spray to farm crops, citrus and ornamental plants. This is a slight increase compared with the previous year.

II. REAFFORESTATION SCHEME — PARKS DIVISION

The Board of Agriculture and Fisheries continued the policy of removing dead trees from areas which are conspicuous from the public roads, but less time was spent on this project due to the increased work of Parks maintenance and in the construction of the Queen's Park Golf course.

Felling Dead Trees

During 1961 7,000 dead trees were felled in Smith's, Hamilton, Paget and Southampton parishes.

Planting

Nearly 9,000 trees, shrubs and palms were used in the various planting schemes undertaken during the year.

Maintenance of Roadside Planting and Hedges

It is pleasing to report that the wilful destruction of plants along the roadsides was far less in 1961 than in any previous year. The main damage was caused in some of the parks where picnicking parties tied tarpaulins to some of the trees.

The hedges were maintained in reasonably good condition, but it is a difficult task to keep all the hedges along the main thoroughfare free of overhanging branches. In some cases it has been necessary to prune hedges rather more drastically than is normally the case to prevent the hedges encroaching onto the roads.

Wayside Parks and Ornamental Planting

This Department continues to maintain 93 separate areas of parks and gardens, with a total of 240 acres. These parks and gardens are scattered throughout the Colony which provide a great deal of pleasure to both residents and tourists.

Easter Lily Planting

Six plots of land in four parishes were again planted with Easter lilies. Most of these plots were visible from the public roads.

III. ENTOMOLOGY, PLANT PATHOLOGY AND OTHER INVESTIGATIONS

The following summary of the Annual Reports of the Assistant Director and the Plant Pathologist give an indication of the investigations carried out during the year under review.

Spittlebug, Clastoptera undulata Uhler

Work was continued on the spittlebug **C. undulata** which is a recently introduced pest of importance on the Australian pine **Casuarina** spp., life history and distribution studies being combined with efforts to achieve effective control by biological and chemical means.

Field populations of **C. undulata** have now been kept under observation for two years. These observations support the following life history for the spittlebug: the winter months are passed principally in the egg state although low levels of nymphs of all stages, as well as adults, are present. The warm weather of May sees the start of the first discernible brood, a small one which is completed by the middle of July. The second brood develops through the remainder of July, August and the first week or so of September. The third, and by far the largest brood develops in September and October and gradually drops down to the low, carry-over, winter level as the weather becomes cooler.

Shipments of parasitised nymphs of **Clastoptera flavidorsa** were received in Bermuda from Jamaica throughout the first eight months of the year. Altogether 1,106 **Carabunia myersi** Waterston (Encyrtidae) emerged from these

shipments and were liberated against **C. undulata** in the field. **Carabunia myersi** is now established in at least five localities in Bermuda and has the potentiality to become an effective control agent.

The insecticide Sevin was used with excellent results to control **Clastoptera undulata.** Used at the rate of 2 lbs. of 50% wettable powder per 100 gallons (U.S.) of water this material gave complete initial kill of both nymphal and adult stages of the spittlebug. Residual control was effective for from 5 to 6 weeks.

Mediterranean Fruit Fly, Ceratatis capitata (Wiedemann).

Two synthetic lures, "Siglure" (Sec-butyl-6-methyl-3 (or 4), cyclohexane-1-carboxylate) and "Trimedlure" (Tertiary butyl-6-methyl-3 (or 4) cyclohexane-1-carboxylate) were used with success in place of angelica seed oil in Mediterranean fruit fly traps. The synthetic lures are far cheaper than the angelica seed oil. Trapping combined with bait spraying and ground spraying kept the Mediterranean fruit fly population at a very low level.

Whitefly, Metaleurodicus cardini

Introductions of parasites and predators of the whitefly **M. cardini** were made from Trinidad in an effort to bring this insect under satisfactory control. Included among the introduced species were the eulophids, **Encarsia meritoria; Encarsia** sp. nr. **variegata** and **Coccophagus aleurodici;** small numbers of syrphid flies of the genus **Baccha** were also introduced along with several thousand coccinellids, **Clistostethus dispar.** All of these introductions were arranged by the Commonwealth Institute of Biological Control. Recovery work must now follow before the programme can be evaluated.

Other Biological Control Activities

A small shipment of parasites was received for release against pustule scale **Asterolecanium pustulans.** No recoveries were made in the area of liberation three months after release of the shipment.

Shipments of **Cryptolaemus affinis** were released against green shield scale **Pulvinaria psidii** and several species of mealybug. **Cryptolaemus** spp. (**C. affinis** and **C. montrousieri** are virtually indistinguishable to all but the specialists) and **Azya orbigera** were seen frequently throughout the Island on hedges and shrubs infested with mealybugs or soft scales. The numbers of these predators were never great but these species do seem to be persisting in Bermuda.

Seven separate shipments of the predaceous snail **Natalina caffra** were received from the Republic of South Africa during the course of the year. This snail proved a very effective predator of **Otala lactea** in laboratory tests. Field liberations were made in areas of heavy **O. lactea** concentrations. Recovery efforts have not yet been successful, although one property owner has reported seeing **N. caffra** in small numbers.

Euglandina rosea., the predaceous snail introduced in 1958 from Hawaii, continued as a successful predator of **O. lactea** in widely scattered areas of the Colony. This predaceous species is no longer found in large numbers in areas of chronic **Otala** infestations such as Tulo Valley and Knapton Hill. A balance seems to have been reached whereby both the predator and the host are now existing at low levels in those particular areas.

Storage of Grapefruit

In the Annual Report for 1960 results of experiments conducted on the storage of grapefruit by the Assistant Director and Mr. Alan G. Dustan was fully reported. The year 1961 saw the implementation of all the suggestions dealing with grapefruit storage in Bermuda which were put forward in the 1960 report.

In March, twenty crates of grapefruit obtained from the Botanical Gardens were used in a storage test in which the value of the fungicidal water wax Lake Alfred 101A was given further trial. Fruit was washed, and that which was damaged was removed from the experiment. While grading was carefully carried out fruit was not as carefully and methodically scrutinized as it had been in many of the earlier tests. This was intentionally done in order to more nearly approach the type of selection which might be expected from the commercial growers.

Five crates (approximately 1 bushel each) of seedless and five crates of seeded fruit were waxed, while an equal number were left untreated. All fruit was placed in storage at 50 F. The fruit was checked at monthly intervals. Those fruit which exhibited storage rots were removed. Notes were taken on external fruit quality as well as losses. The table at Appendix "H" presents the result of this experiment.

The results of this test gave further support to the value of fungicidal water wax for prolonging the storage life of grapefruit. The treatment is simple and quickly carried out, the cost is reasonable, and the results very satisfactory.

The Plant Pathologist

Mr. E. A. Manuel returned to the Colony in September, 1961, after having successfully completing post graduate studies in plant pathology at the College of Science and Technology Field Station, Silwood Park, Berkshire, England.

IV. REPORT ON ARABLE LAND

A report was prepared on the present status of arable land in Bermuda during the summer of 1961.

To provide a visual aid to the understanding of the critical problem of destruction of arable land, aerial mosaics of the Island were obtained from the Hunting Survey Corporation of Toronto, Canada. These mosaics were on a scale of 1 inch to 400 feet and gave a clear and accurate picture of all parts of the Island.

A Survey was made of all the remaining areas of arable land in the Colony which were $\frac{1}{2}$ acre or more in area. These areas were circled in red on the aerial mosaic and assigned a number. An accompanying key provided information on the ownership, and area of each encircled property. Natural boundaries were used in some cases rather than the boundaries of ownership. This was only done when there was doubt as to the owners of the properties involved. A number of difficulties were experienced in obtaining accurate information on ownership with the result that some of the information included was sketchy with the possibility existing that the ownership given was not correct in every instance. The compilation of the data on arable land was further complicated by land

development which has taken place since 1957 (the year the aerial mosaic was made). Notwithstanding these shortcomings, the aerial photographs, along with the keys, provide an excellent indication of the present extent of arable land in the Colony.

A total of 251 separate properties were shown on the aerial survey sheets with a combined arable area of 659 acres. A breakdown of the properties according to the acreage of arable land involved is given below:—

Acreage of Arable Land

	½ - 1½	over 1½ - 3	over 3 - 6	over 6
Number of Properties	137	60	30	24
Acreage	131.0	144.5	138.5	245.0
Per cent of total Arable Acreage	20%	22%	21%	37%

From this table it can be seen that 42% of the arable land in the Colony is to be found on properties in which the total arable acreage is 3 acres or less. The remaining 58% of the arable land is to be found on properties in which the area of arable land exceeds 3 acres. It is apparent from this that the smaller areas of arable land (½ - 3 acres) must be safeguarded as well as the larger tracts, if a significant acreage of arable land is to be preserved.

Of the 659 acres of arable land covered in this survey all but 50 acres were in actual cultivation. Most of the 50 acres not in use were lying idle because of pending sale or development of the properties involved.

The arable land which remains in the Island could have great importance in a time of emergency. Productivity figures for an acre of land are not easily determined because of the many factors which can limit crop production. However, the figures given below indicate what one acre of land should produce when set out in the following crops:—

Crop	Average yield acre	Possible Crops per year
Bananas	15,000 lbs.	1
String Beans	3,000 lbs.	4
Cabbage	16,000 lbs.	2
Carrots	15,000 lbs.	2
Corn	2,400 doz. ears	2
Onions	15,000 lbs.	1
Potatoes, Irish	12,000 lbs.	2
Potatoes, Sweet	5,000 lbs.	1
Tomatoes	10,000 lbs.	2
Turnip, Swedish	20,000 lbs.	2

The quantity of food which could be produced locally could supply an important part of a minimum daily diet for our population in a time of emergency. For example, 400 acres cropped in potatoes twice a year could yield enough potatoes to provide 50,000 people with ½ lb. of potatoes daily.

In addition to the data gathered on the existing status of arable land certain recommendations were made for the preservation of that arable land which remains. These included the strengthening of present Building Authority Regulations, the establishment of some control over the sub-division of arable land, and the mandatory siting of all houses in such a way as to conserve arable land.

V. HORTICULTURE

It is again pleasing to report a continued expansion of the horticultural activities of this Department. The Horticulturist and the Superintendent of the Botanical Gardens, have been extremely active in their respective fields, and as a result ornamental horticulture has already reached a high standard of efficiency.

Botanical Gardens

The Garden for the Blind was officially opened by Lady Gascoigne on the 29th November, 1961, when a large gathering of interested persons assembled for this ceremony. The illustrated Guide of the Botanical Gardens was received from the printers in December, and the sales of this Guide at the time of reporting are most encouraging.

While further improvements were made in the Gardens during the year, the problem of the future is how to maintain the amenities of the Gardens, and the activities of the Department once the extension to the King Edward VII Memorial Hospital are commenced in 1962. The Botanical Gardens will, as a result of this Hospital extension, be reduced in size by two and one-half acres, depriving the Department the use of two trial plots, the Victory citrus orchard, and the large collection of Oleanders on Oleander Hill.

Montpelier Arboretum

The Arboretum continues to develop according to plan and the whole place is showing up to good advantage. A start was made on the new entrance from Montpelier Road towards the end of the year, and it is hoped that this entrance will be completed early in 1962.

Tulo Valley

The whole of the plant nursery work was transferred from the Botanical Gardens to Tulo Valley during the year under review. On the 9th October, 1961, the Tulo Valley was opened to the public. This was made possible by the erection of a new potting shed — office and other installations. The cottage at the Nursery was enlarged and is occupied by a senior officer of the Department.

Nursery Work, including Citrus Propagation

The total number of plants distributed from the Nursery in 1961 amounts to 37,648. Of these, 8,747 were used by the Department for the various planting schemes, and the balance either sold to the general public or donated to the Arbor Societies.

Some 1,439 citrus trees were budded in 1961 of which 895 were large enough to be offered for sale.

Trial Plots

The vegetable trial plots were again used to test new varieties and for demonstration purposes. Samples of each consignment of the imported potato seed were planted to check the incidence of virus diseases.

Advisory Services

This service was well maintained throughout the year, by various officers, depending on the nature of the enquiries.

School Gardening

The Horticulturist continued to take an active interest in School gardening, by making regular visits to those schools where gardening forms a part of the curriculum.

Arbor Societies

Assistance was given to the Arbor Societies as in former years, in the form of funds, plants and labour.

VI. ANIMAL HUSBANDRY

Control of Animal Diseases

As in previous years, all the dairy cattle were subjected to a tuberculin test. Seven reactors were found, out of a total of 1,411 dairy cattle tested. The reactors were slaughtered and the owners compensated.

Artificial Insemination Scheme

Good progress was made when the Artificial Insemination Scheme for cattle was initiated during the early part of the year. Unfortunately, due to technical difficulties with the deep freeze refrigerator for holding the semen, and the resignation of Dr. C. W. Brown, Government Veterinary Officer, in August, the scheme was temporarily suspended. Fortunately Mr. M. R. Shastri, a member of the Department became keenly interested in the scheme, and after a four weeks, course at the Waterloo Cattle Breeding Station, Ontario, Canada, Mr. Shastri was appointed Artificial Insemination Technician in December, and the programme was restarted. At the time of reporting, excellent response is being made to the scheme by many of the farmers. The percentage of successful insemination is in the region of 64%.

VII. WHOLESALE MARKETING CENTRE

Produce to the value of £57,920 was purchased by the Wholesale Marketing Centre during 1961 which was just over £2,000 less than the 1960 figure of £60,000. Unfortunately, the year's operation showed a trading deficit of £4,716. See appendix "C". A detailed examination of the trading accounts was made by the Board in September to ascertain the reasons for this deficit. A loss in the storage of potatoes which amounted to over 2,000 bags was the main cause, but loss of cabbage due to inadequate storage temperature, also contributed. Certain changes were made in the operation of the Centre, and during the last four months of the year, a slight trading profit was shown.

The Legislature approved the expenditure of up to £50,000 for the extension of the Chillrooms at Prospect. A contract was awarded, and a start on the project was made in December. These additional facilities will be of great value in storing the produce at the correct temperature, and should reduce losses very considerably.

VIII. AGRICULTURAL EXHIBITION

The twenty-sixth Agricultural Exhibition was held on the 20th, 21st and 22nd April, 1961. Undoubtedly, this was the best Exhibition since the function became an annual event in 1955. Fortunately, the weather was fine and warm, and the attendance during the three days was 2,000 more than the previous year, as is shown in the following table:—

Year	Exhibitors	Entries	Paid Admission
1955	305	2,000	9,957
1956	385	2,450	14,400
1957	391	2,486	10,500
1958	454	2,585	7,800
1959	436	3,061	10,255
1960	435	2,229	13,000
1961	488	2,971	15,000

Annual Citrus and Poultry Show

The Annual Citrus Exhibition and the Poultry Show was held in the Botanical Gardens, under the auspices of the Citrus Growers Association, and the Poultry Fanciers Society, in the month of January.

Display of Citrus Fruit — Royal Horticultural Hall

A display of Bermuda Citrus fruit, supplied by several growers, was staged by the Director at the Royal Horticultural Society's fortnightly show, held in London on the 28th February and 1st March, 1961. This exhibit was awarded the Lindley Silver Gilt Medal.

IX. EXTENSION WORK

Apprenticeship Scheme

An apprenticeship scheme was commenced in April, 1961, with the object of training boys in the art of practical horticulture. Six boys of school leaving age joined the scheme in April; the number has now risen to eight. While the emphasis is placed on practical horticultural work, a series of lectures is given every Saturday morning by the senior officers of the staff. These lectures cover the cultivation of fruit, flowers and vegetables, elementary botany, entomology and plant pathology. It is intended that the boys will serve a four year apprenticeship. The results so far are most encouraging; the boys are responding extremely well to the training and facilities offered.

Lectures and Demonstrations

Lectures were given by the Staff, on agricultural and horticultural topics to various organisations throughout the year. Advantage was again taken of the time made available by the Bermuda Broadcasting Company, Ltd., every second Wednesday of the month, to discuss subjects of general interest.

Agricultural Advisory Services

One Agricultural officer made regular visits to the farmers to discuss current problems and to make a survey of crops under cultivation.

Publications

The publication of the monthly bulletin was continued with a circulation of 750 copies per month. Other Department Publications include "The Guide to the Botanical Gardens", revised by G. R. Groves; "The Storage of Grapefruit in Bermuda", by I. W. Hughes.

X. AQUARIUM, MUSEUM AND FISHERIES

By an Act of the Legislature, the Department of Agriculture became known as the Department of Agriculture and Fisheries, with effect as from the 1st August, 1961. The Aquarium and Museum were also transferred to the Board of Agriculture and Fisheries at the same time.

The Curator of the Aquarium and Museum reports as follows:—

The year 1961 established another new record for attendance at the Aquarium, Museum and Zoo. It also saw the transfer of this organization from the Trade Development Board to the administration of the Board of Agriculture and Fisheries, the change-over becoming effective on the 1st August, 1961.

Paid attendance for the year 1961 increased by 2,331 persons over the former record year of 1959; the overall attendance showed an increase of 1,914. There were considerably fewer complimentary admissions during 1961. A total of 84,273 persons paid the admission fees to see the exhibits, and there were 3,700 who received complimentary admission. The latter group were made up of the following: 2,209 school children and teachers in organised classes, 1,214 service personnel and others at the request of the Trade Development Board, and 277 bona fide travel agents or their representatives. Total receipts for the year amounted to £14,177. 4. 3d., all of which was deposited in the Colonial Treasury. A balance sheet appears at the end of this Report. (See Appendix "F".)

General

It is not possible to avoid a certain amount of repetition in the Annual Report where certain aspects are concerned. This is particularly true in respect of the Curator's efforts to obtain personnel genuinely interested in Aquarium and Museum work, which to date have not produced satisfactory results. Within a few years both the Assistant to the Curator and the Curator will be retiring. It is, therefore, essential in the near future, to make further efforts to obtain the services of suitable personnel who will be able to ultimately assume the responsibilities of the senior positions.

The condition of the buildings, pumps, boat, and grounds, remains satisfactory. Emergency repairs had to be made to the boat slip late in the year, and considerable maintenance had to be carried out in respect of the main salt water supply line within the Aquarium building. After many disappointments in negotiations with European firms relative to the supply of a new thermoplastic pipeline, a satisfactory arrangement was made in Florida through the personal contact of the Curator and which resulted in the purchase of the required

materials for £750, whereas the anticipated cost was nearer £1,100. Installation of the new polyvinyl chloride (PVC) pipe should be completed by the end of March. The entire job is being carried out departmentally at no additional cost.

In addition to the replacement of the main supply pipeline, twenty-seven polyethylene tubes with hard rubber valves attached will be installed as bottom drains on the exhibition tanks to replace the lead tubing which has perished at the valve ends. Also, to be re-established, is a small pipeline for the supply of air to the tanks. Equipment for this is already in hand. Upon the completion of the entire installation, the Aquarium will actually be in better mechanical condition than on its opening day, 1st February, 1928, thirty-four years ago.

Museum

A reference collection of Lepidoptera, (butterflies and moths) is being assembled and housed at the Museum by Mr. Albert Zerkowitz of New York. He is about to retire and will take up residence in Bermuda in 1962.

Once again, work on the renewal of the Museum floor had to be postponed due to the uncertainty concerning the purchase and housing of the marine archaeological finds of Messrs. Tucker and Canton, more popularly known as the Tucker Treasure. However, as the Treasure was purchased by the Government in 1961, it now seems likely that the new building will be established for this purpose, and it is anticipated that the building should be completed toward the end of 1962. The re-flooring of the present Museum will be carried out at the same time.

Zoo

No acquisitions were made during 1961, and there were no losses of note. Considerable maintenance was required on the cages, particularly in respect to the doors. However, these were renewed at little expense through the purchase of suitable types at an auction.

Fisheries

For the first time in the history of the Colony the fishing industry seems to have obtained a parent body which intends to do something toward the betterment of the fisheries. Numerous plans have been tentatively outlined to the Board, and plans are already well advanced at the Aquarium for the staff to continue to carry out research into the enormous potential for the development of the pelagic (off-shore) fishery.

A complete revision of the Fisheries Regulations, 1953. has been recommended, and the changes, if brought into effect, should do much to lessen the confusion of the present time. It is anticipated that great benefits will result from the enforced registration of all fishermen and their "trade-mark", the latter mark to be placed on all of their fishpot floats, and pots where practicable. This should tend to reduce the numbers of stolen fishpots.

Miscellaneous

In March, 1961, the Curator recommended that two portions of coral reef be set aside in perpetuity for preservation. This would not prevent fishing in the areas, but would prevent desecration by reclamation, etc. This recommendation was approved by the Trade Development Board, and forwarded to the

Executive for consideration. This would follow the examples set by the U.S. Virgin Islands, the Bahamas Government, and the State of Florida. All have realized the detrimental effects of commercial exploitation on reef areas, and have taken steps to ensure that certain areas will be preserved permanently. The case of Bermuda is again unique in respect of coral reefs. It is the northernmost point in the world where corals grow. The barrier reefs, or breakers, afford tremendous protection from wave erosion, and certain corals are tending to build up our reefs. Aside from these "invisible" assets, certain reefs provide economic advantages through the provision of some of the most beautiful sea gardens in the world, and ALL furnish a breeding ground and place of shelter for our fish population.

The Curator has been asked by the Director of the Waikiki Aquarium in Honolulu to consider a temporary exchange of positions for a period not exceeding one year, commencing in the early part of 1963. The exchange is not to entail any additional expense to the Bermuda Government. As a decision has to be made by the 30th June, 1962, further details will be presented to the Board in the near future.

XI. CLIMATOLOGICAL STATION

Daily weather records were kept at the Botanical Gardens. The rainfall figure for 1961 was 52.53 inches, more than 4 inches below the average annual rainfall.

The rainfall for the months of February, March, September and December was well below the established average. The dry conditions in the late winter and spring have influenced the citrus crop which was generally light. The hottest days of the year were August 1st and September 8th, when the thermometer read 87.8°F., while the lowest temperature, 47.2°F, was recorded on February 7th.

A summary of weather data for the year is to be found in Appendix "C"

XII. FINANCIAL

From the financial statement, Appendix "B", compiled from records kept at the Department of Agriculture and Fisheries, it will be observed that the total allocation of funds for 1961 was £227,464 of which £198,520 was spent. Departmental receipts, including the resale of vegetables purchased through the Wholesale Marketing Centre, and the revenue from the Aquarium and various receipts for services rendered to the public, amounted to £79,329 as shown on Appendix "A". If the receipts be deducted from the actual expenditure, the actual operating cost of the Department of Agriculture and Fisheries for 1961 was £119,191.

XIII. ACKNOWLEDGEMENT

I would like to record my grateful appreciation to the Chairman and members of the Board of Agriculture and Fisheries for their untiring help and guidance throughout the year.

To the members of my staff, I likewise express my thanks for the loyal support and the efficient manner in which they have discharged their duties. My thanks are also expressed to the numerous members of the public, and especially tc the many organizations connected with agriculture, horticulture and fisheries from whom I have obtained much useful advice and information.

Respectfully submitted,

G. R. GROVES,

23rd February, 1962. Director of Agriculture and Fisheries.

APPENDIX "A"

Summary of receipts for the year 1961

Vote 2	(a)	Marketing Centre	£54,271	2 9
2	(b)	Service to Citrus growers	6,160	19 0
2	(c)	Reafforestation services	946	11 3
2	(d)	Other receipts	3,930	6 8
2	(e)	Aquarium and Museum	14,020	0 7
			£79,329	0 3

APPENDIX "B"

Expenditure for period 1st January to 31st December, 1961

Vote	Service	Amount of Vote	Expenditure	Balance Lapsing
1	Fees to members of the Board	£ 250 0 0	£ 147 12 0	£ 102 8 0
2 - 7	Salaries — Established Officers	11,778 0 0	11,495 8 2	282 11 10
7a	Chief Fisheries Officer, Curator of Aquarium and Fisheries Officer	1,750 0 0	875 0 0	875 0 0
8 - 11	Salaries, non-established officers	6,992 0 0	5,165 13 8	1,826 6 4
11a	Aquarium and Museum	6,992 0 0	5,165 13 8	1,826 6 4
12 - 13	Bonus and non-pensionable allowance at the rate of 25 per centum	4,702 0 0	4,617 9 11	84 10 1
12a	Non-pensionable allowance to Civil Servants at the rate of 25% at August 1st, 1962	437 0 0	174 5 0	262 15 0
14	General Grant	5,000 0 0	4,977 1 1	22 18 11
15	Control of Animal Diseases and Improvement of Livestock	2,500 0 0	1,466 14 0	1,033 6 0
16	Control of plant diseases and pests	9,500 0 0	9,474 9 1	25 10 11
17	Horticulture	3,500 0 0	3,500 0 0	0 0 0
18	Government House Gardens	3,800 0 0	3,763 14 11	36 5 1
19	Departmental contingencies, etc	400 0 0	368 13 9	13 6 3
20	Marketing Investigations	500 0 0	496 7 0	3 13 0
21	Cold storage plant operation	5,000 0 0	3,462 13 5	1,537 6 7
22	Upkeep and operation of agricultural equipment and motor vehicles	5,500 0 0	4,483 16 2	16 3 10
23	Purchase of agricultural and reafforestation machinery and equipment	3,200 0 0	2,981 8 9	218 11 3
24	Purchase and storage of agricultural supplies	600 0 0	220 18 3	379 1 9
25	Purchase and storage of potatoes and other agricultural produce for resale	70,000 0 0	57,920 17 5	12,109 2 7
26	Agricultural Exhibition	3,000 0 0	3,000 0 0	0 0 0
27	Biological control and agriculture research	5,000 0 0	3,213 19 1	1,786 0 11
28	Reafforestation roadside planting and maintenance of public parks and gardens	60,000 0 0	59,963 7 5	36 12 7
29	Publications	600 0 0	595 14 7	4 3 5
30	Grants for agricultural and horticultural extension work and agricultural education	750 0 0	621 12 9	128 7 3
31	Grant to Arbor Societies	200 0 0	25 0 0	175 0 0
32	Maintenance of School Playing Fields	4,500 0 0	4,319 12 2	180 7 10
33	Purchase of Motor Vehicles	600 0 0	600 0 0	0 0 0
34	Erection of shed and small office at nursery	1,000 0 0	981 12 1	18 7 11
35	Montpelier Arboretum	3,500 0 0	87 19 6	3,412 0 6
36	Tulo Valley Nursery (add)	800 0 0	795 5 9	4 14 3
37	Aquarium and Museum General Grant	5,113 0 0	1,959 16 4	3,153 3 8
		£227,464 0 0	£198,490 3 7	£27,973 16 5

APPENDIX "C"

WHOLESALE MARKETING CENTRE

Trading Profit and Loss Account for the Year 1961

Stock in hand 1st January, 1961	£ 2,234	Sales during year	£53,966
Purchase during year	57,920	Stock in hand 31st December, 1961	1,472
		Trading deficit c/d	4,716
	£60,154		£60,154
Trading deficit b/d	£ 4,716		
Salaries, Marketing Officer and Assistant	1,951		
Wages, Porters	1,134		
Electricity	974		
Rent	1,070		
General Expenses	1,326	Deficit for year	11,171
	£11,171		£11,171

APPENDIX "D"

Summary of Land Usage for Commercial Agriculture

Vegetable Crops	389 acres
Flower Crops	40 "
Fruit Crops	150 "
Fodder Crops	50 "
Pasture Land	450 "
Bare Fallow	30 "
	1,109 acres

APPENDIX "E"

CROP PRODUCTION

Vegetable	No. of Crops possible per year	Area under crop expressed in acres	Av. Yield per acre	Total Yield in lbs.	Unit Value	Farm Value to nearest £
Beans	4	36	3,000	108,000	1/6	£ 8,100
Beets	2	6	8,000	48,000	8d	1,600
Broccoli	2	15	5,500	825,000	1/6	6,187
Cabbage	2	20	16,000	320,000	8d	10,667
Carrots	2	55	15,000	825,000	9d	30,992
Onions	1	7	15,000	105,000	9d	3,937
Potatoes, Irish	2	240	60 brls.	14,400 brls.	75/- per brl.	54,000
			9,600 lbs.	2,304,000 lbs.		4,167
Potatoes, Sweet	1	20	5,000	100,000	10d.	4,167
Tomatoes	2	35	10,000	350,000	1/4	23,333
Miscellaneous	1	130	8,000	1,040,000	7d.	30,333
		564		6,025,000		£173,246

FRUITS

	Area under cultivation in acres	No. of Trees	Average yield per tree in dozens	Average yield per acres in lbs.	Total yield	Unit Value	Farm Value
Citrus	100	10,000	10	—	100,000 dozs.	5/-	£25,000
Bananas	50	—	—	15,000	750,000 lbs.	8d.	25,000
							£50,000

Lily Bulbs and Flowers

Areas in Cultivation in acres	No. of bulbs planted	No. of bulbs exported	No. of boxes of flowers exported	Value
7	420,000	Nil	2,821	£7,930

MILK

Total production expressed in gallons	Unit Value	Value
761,886	5/8	£215,868

MEAT PRODUCTS

Beef in lbs.	Value	Veal in lbs.	Value	Pork in lbs.	Value	Poultry in lbs.	Value
91,200	£6,840	6,960	£522	108,500	£10,850	40,000 lbs.	£4,000

EGGS

Expressed in Dozens	Unit Value	Value
700,000	5/-	£175,000

DAIRY ANIMALS

Cows	Heifers	Bulls	Total
1,047	324	40	1,411

HORSES

Farm and Truck	Carriage	Saddle Horses	Race Horses	Ponies	Donkeys	Mules	Total
86	28	39	38	52	6	1	250

PIGS

Sows	Boars	Store Pigs	Piglets	Total
150	25	900	600	1,675

GOATS — 300

APPENDIX "F"

AQUARIUM AND MUSEUM

Balance Sheet — 1961

REVENUE		EXPENDITURES	
Receipts from admissions, deposited in Colonial Treasury	£14,177 4 3	Staff emoluments	£13,709 13 8
Add operating loss	2,879 5 9	General Expenses	3,346 16 4
	£17,056 10 0		£17,056 10 0

APPENDIX "G"

SUMMARY OF WEATHER DATA FOR PERIOD JANUARY 1st TO DECEMBER 31st, 1961

MONTH	PRESSURE					AIR TEMPERATURE				RELATIVE HUMIDITY			RAINFALL	
	Mean daily mb	Mean Temp. 0900 °F	Mean Temp. 1700 °F	Mean daily maximum °F	Mean daily minimum °F	Mean daily °F	Absolute Maximum °F	Date	Absolute Minimum °F	Date	Mean 0900 %	Mean 1700 %	Dies	Total amt. inches	Total No. of rain days.
I	1020.6	62.9	62.6	67.6	58.4	62.7	73.3	15	52.1	26	76	73	74	4.81	18
II	1022.6	63.1	63.2	67.6	57.3	62.4	73.1	24	47.2	7	72	74	73	2.18	14
III	1019.1	64.7	64.3	68.8	58.6	63.7	73.6	9	48.6	23	70	69	70	1.48	9
IV	1017.1	66.7	66.2	70.3	60.9	65.6	75.3	27	50.7	10	71	73	72	8.08	13
V	1022.8	69.6	69.8	73.1	63.7	68.4	77.5	23	51.3	7	78	76	77	7.97	14
VI	1024.1	75.8	76.3	79.0	70.6	74.8	81.9	29	64.3	1	83	82	82	5.25	11
VII	1022.9	80.3	81.6	84.4	74.3	79.3	87.2	21	66.6	3	80	77	78	3.45	9
VIII	1022.7	81.6	82.2	85.7	72.9	79.3	87.8	1	72.0	8	79	76	77	4.02	12
IX	1019.7	81.1	80.9	85.4	74.1	78.9	87.8	9	70.1	2	74	74	74	1.68	12
X	1018.2	77.1	75.5	80.7	70.5	75.6	86.0	3	59.2	31	72	76	74	4.74	16
XI	1017.2	70.3	68.9	74.2	64.9	69.5	81.2	2	57.7	30	71	72	71	6.44	21
XII	1020.8	65.5	65.3	70.7	60.5	65.6	76.2	13	51.5	27	72	73	72	2.43	11
Mean	1020.7	71.6	71.4	75.6	65.6	70.5					75	75	75		
Extreme							87.8	Aug. 1-Sept. 9	47.2	Feb. 7					
Total														52.53	160

APPENDIX "H"

Decay Control Experiment with Seeded and Seedless Grapefruit Storage Held at 50°F.

Treatment	No. of Fruit in Test	% Loss at end of 1 Month	2 Months	3 Months	Remarks
Seeded fruit - Waxed	242	.0	2.8	10.0	Fruit firm and attractive at end of test.
Seeded fruit - Unwaxed	203	13.5	35.0	50.0	Remaining fruit soft and spongy.
Seedless fruit - Waxed	277	.7	2.1	5.0	Fruit in very good condition.
Seedless Fruit - Unwaxed	279	10.0	27.0	49.0	Remaining fruit in very poor condition - soft and shrunken.

THE BERMUDA
PRESS LTD